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ABSTRACT

This study is concerned with problems in language learners' intonation of English. Ten intonation problems were found in the learner speech of two adult Spanish-speaking males: (1) range of pitch, (2) initial rise, (3) final fall, (4) rise to final stressed syllable, (5) placement of prominence, (6) final rise for questions, (7) total question elevation, (8) slope of the peaks, (9) within-word pitch movement, and (10) pitch movement on segmentals. Acoustic analysis was made using sound spectrograms; the data were also judged perceptually. Acoustic evidence showed significant differences between the learner speech and the speech of a native English speaker in all ten areas. Analysis of the learners' Spanish intonation patterns showed evidence to suggest that the native patterns were transferred onto their learner speech in English, specifically in their range of pitch, the contours of statements, and Yes/No question. The study also revealed that the more experienced speaker's intonation patterns were closer to those of the American than those of the new arrival. (Author/AMH)

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Learner Intonation - A Pilot Study

Nancy Backman

Problems in the language-learners' intonation of English have been analyzed here both perceptually and acoustically using sound spectrograms. Intonation of several syntactic structures was examined by having two Spanish-speaking adults learning English and a native speaker of American English read 35 sentences placed within dialogues. The Spanish speakers also read the dialogues in Spanish in order that the data could be examined from the contrastive analysis point of view, namely, where inappropriate intonation in learner speech occurred, had the learner transferred his native-language intonation patterns onto the target language?

To prepare for a future study of the development of learner intonation patterns over time, a new arrival and a more experienced learner were selected in order to obtain data at two points in the learning process. The subjects were two young-adult males from Monterrey, Mexico. Studies of dialect differences in Spanish (Kvavik 1974) showed the importance of controlling for this factor. Males were selected because intonation patterns differ between the sexes (Brend 1972). The American speaker was a male educated in the Boston area, the location of the ESL program for the language learners.

This study concerns itself with only one of the prosodic features of language, intonation. The other two aspects of prosody, loudness or stress (amplitude in acoustic terms) and rhythm or timing (duration) were not examined. It has been argued (Bolinger 1976) that pitch movement is the most perceptually salient of the prosodic features. Pitch prominence, Leiberman's term (1967) will be used for what is looked at here, namely the movement of the pitch on the important words in a phrase. Confusion could arise over the term "stress" as this has been used in the past to refer to word stress, sentence stress, and increased loudness as well as pitch.

The acoustic analysis was made on a Kay sound spectrograph using a wide-band filter and then a scale magnifier on the narrow-band filter. Tracings of the pitch contours were made off the third harmonic. Figure One is an illustration.

Note that the voice pitch is measured acoustically be examining the fundamental frequency (Fo) in units called hertz. A bottom ordinary range (BOR) can be calculated by averaging the Fo of the pitch on unstressed syllables. The Spanish speakers had a BOR of about 110 hz. In one utterance the pitch reached a peak of 220 hz. Relating this to music, 110 to 220 hz is an octave, 110 being the second "A" below Middle "C", 220 being the "A" just below Middle "C"; (440 is the "A" above Middle "C").

The perceptual analysis of a selection of utterances was made by two judges experienced in transcribing intonation contours. There were four parts to the judgements: (1) the judges drew the contours they heard; (2) they marked the appropriateness or inappropriateness of the contour for the context in which the

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utterance occurred; (3) if they judged it inappropriate, they transcribed what the contour should have been; (4) they made comments including factors which might have confounded the intonation judgements such as poor timing. For the appropriateness ratings, the judges were in agreement 73% of the time. For another 15% of the sentences, one judge marked the sentence wrong, the other heard the difference but judged the sentence acceptable. Within the sentence, the judges agreed on the location and nature of the error in 77% of the cases.

Results are presented below for ten intonation problems identified by this research. The difficulties of the language learners are found in their range of pitch, statements, Yes/No questions, and an unexpected finding of pitch movement on certain segmentals.

Range of Pitch. The American's range was 90 hz as measured over several sentences from BOR(Bottom Ordinary Range) to the peaks of prominent syllables. In Spanish the new arrival and the experienced speaker ranged 35 and 45 hz respectively. When speaking English the new arrival's range was close to his Spanish one, 50 hz. However, the experienced learner's range was wider in English, 80hz, which more closely approximates the American's range. This wider range for the experienced learner was especially noticable in longer sentences.

O'Shaughnessy (1976) has found what he termed an "anticipation effect." For longer sentences, a higher pitch is used in the first part of an utterance to allow for a gradual descent towards the speaker's more usual range at the end of an utterance. This anticipation occurred in the speech of the American subject and the experienced learner. It did not occur in the English of the new arrival. It is interesting to note that the experienced learner's range was even greater than the American's on some of the long sentences, suggesting that in his attempt to increase his range, he over-compensated.

Statements. (Results for Range of Pitch and Statements are summarized in Table I)

In presenting the results for statements, I shall discuss four aspects of intonation, initial rise, final fall, pitch of the syllable prior to the final prominent syllable, and placement of prominence.

Looking at the initial rise and final fall together, the English speaker has a large pitch movement. In Spanish this pitch movement is small. In the learner speech, the pitch movement is not greatly increased for the new arrival; it is for the experienced speaker however. He rises on the average from 15hz in Spanish to 35 hz in English, and increases the falls from 20 hz in Spanish to 50 hz in English.

I also examined the pitch of the syllable prior to the final prominent syllable. It had been suggested in the literature (Delattre 1965) that this syllable was high in Spanish and low in English thus making the signal for finality distinctly different between the two languages. I found this to be the case for my subjects. The American rose 37 hz to the final prominent syllable.

For Spanish there was little or no rise, the syllable was on the same level. For the learner speech, a slight increase of 14 hz for the experienced speaker was noted; the new arrival did not rise at all to the final prominent syllable. Thus the data here supports Delattre's (1965) hypothesis of different finality contours between English and Spanish, and the learner speech shows that the subjects are incorrectly using their Spanish pattern when speaking English.

For placement of prominence, judges noted consistently that the learner speech had either the early syllables too high, or the final syllables too low. Acoustically it was found that in sentences judged wrong, pitch prominence rarely occurred towards the end of the sentence. This pattern of pitch prominence early in the sentence was alsofound for Spanish. The American always had a prominent syllable at the end. Figure One illustrates these facts. Note how the experienced learner, in English, has placed prominence toward the end. He was judged as having appropriate English intonation on this sentence.

This last acoustic finding of prominence placement towards the beginning of the sentence is in accord with Stockwell and Bowen's (1965) comparison of English and Spanish. They contrasted perceptually the intonation of the two languages and found prominence moved the the left in Spanish and to the right in English. The data presented here shows that the language learners are transferring this Spanish pattern onto their English speech.

Yes/No Questions. In Yes/No questions four aspects of intonation were studied: the final rise, the total utterance elevation from the BOR, the slope of the top of the peaks, and the pitch movement within the most important syllables. (Table II summarizes the findings).

The final rise in English was much higher than in Spanish, 105 hz for English, 45 hz in Spanish for both subjects. The learner speech had even less rise than the Spanish. Perhaps language-learner hesitancy, discomfort with the recording situation or the fact that the questions were based on role play influenced these results. In any case, the language learners did not use an appropriate rise in their English speech for this data.

The total utterance elevation from BOR for questions was higher in Spanish than in English, 35 and 40 hz as compared to 15. In the learner speech the new arrival keeps his pitch elevated by about the same amount in both languages. The experienced speaker drops his voice which is more in line with the American's elevation for questions.

Judges were unable to isolate further what sounded inappropriate about the questions; something was wrong however. Two other facts emerged from the acoustic analysis. In English the top of the peaks of the important words were in an ascending slope. In Spanish, the slope of the peaks was level or descending thus showing a distinct difference between the pitch movment of the two languages for yes/no questions. For the learner speech of both subjects in English, the slopes were mixed, some rising, some level. Thus the consistently rising pattern of English had not yet become established.

An outstanding difference was found on the pitch movement within important syllables in the question. The acoustic measurements showed that in English the

movement was usually a rise-fall curve. In Spanish the syllables had only a sharp drop. In the learner speech, both the curve and the sharp drop were present, with no great differences between the two speakers. Delattre (1965) had found these sharp movement in Spanish for declarative sentences when he compared Margaret Mead and Diego Rivera giving lectures. Diego Rivera, in Spanish, had abrupt pitch changes; Margaret Mead's speech was characterized by curves in a inclined "S", (∿) The Spanish data reported on here, then, shows the same sharp downward movements for questions as Delattre did for declarative statements.

Thus for Yes/No questions distince differences between English and Spanish emerge regarding final rise, total elevation, slopes of pitch peaks for the total utterance, and movement within the syllable. However, the language learner data is not nearly so clear as the data for statements, nor are there as sharp distinctions between the new and experienced learners. It is possible that there is a greater variability in the intonation of questions which makes it difficult to draw conclusions from such a small sample.

Pitch movement on segmentals. Now to the unexpected finding. It had been my assumption that all pitch movement would occur on the vowels; however in my first analysis of the data I could hear that movement occured on certain consonants for the American speaker, whereas no movement seemed to be made on these consonants by the language learners in English. An additional set of 12 dialogues were designed to control for the environment of the consonants, and four segmentals were selected for acoustic analysis. These were the liquids /l/ and /r/, and the glides /w/ and /y/. The additional data confirmed my suspicions. The American moved an average of 35 hz on these segments. The new arrival and the experienced speaker moved very little. The duration of the segments was also measured. Upon occasion the experienced speaker extended the duration of the segment, but not in any systematic fashion. This data documents the interaction between the prosodic and segmental features of the language, a fact which must be kept in mind in any discussion of intonation.

To sum up, this study is the first to examine in a controlled way the intonation of the language learner. Both perceptual judgements and acoustic measurements were used. I was able to measure acoustic differences between American English intonation patterns and those of the language learners. Judgements confirmed that these acoustic differences were often perceptually noticeable ot American listeners. I also measured acoustic differences between Spanish and English intonation patterns and found evidence to suggest that my subjects placed their native patterns onto the target language in their range of pitch and the contours of statements and Yes/No questions. Finally I showed that the more experienced speaker had intonation patterns closer to those of the American than did the new arrival. A longitudinal study currently in progress will tell if these are developmental.

In conclusion, I would like to cite the only other study which, to my knowledge, mentions learner intonation. Jenner (1976) presents his perceptions of the problems Dutch speakers have learning English. He found what he terms "interference" from Dutch in four areas of intonation: (1) Dutch has a narrower pitch range than English causing the language learners to use a more level tone; (2) Dutch speakers seem to mishear the prominent syllable and confuse it with the first stressed syllable as in "strong as a man". In other words, they move prominence to the left; (3) The rise-fall seems to be entirely absent from the learner speech, as in "wonderful idea". Dutch speakers use a

falling pitch only; (4) The pitch of unstressed syllables is that of an adjacent syllable, not as in English where the unstressed syllables either glide up to the stressed ones, or are lower than the stressed one.

Thus it seems that both Dutch and Spanish speakers find some of the same difficulties hearing and producing the pitch contours of American English. This raises the fascinating question of universal problems in acquiring a second intonational system: what difficulties arise because of contrasts between the languages and what difficulties are due to the perceptual and cognitive mechanisms of the language learner?

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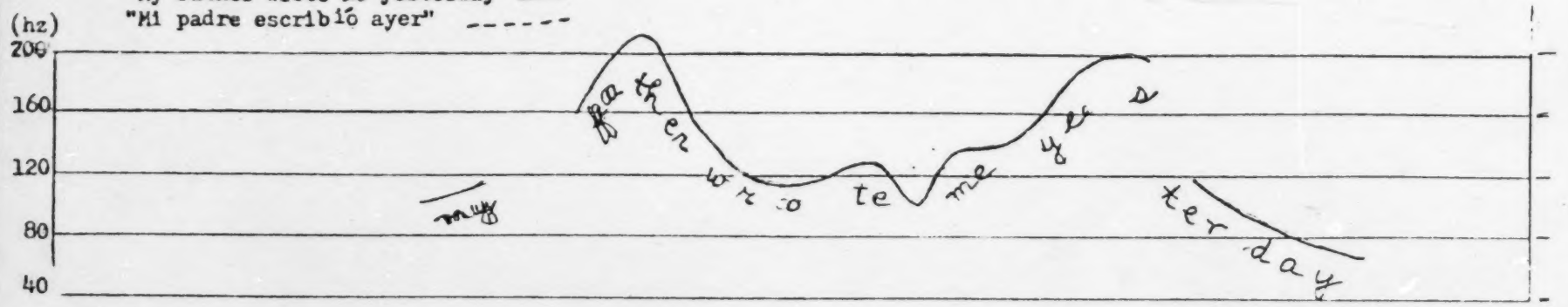
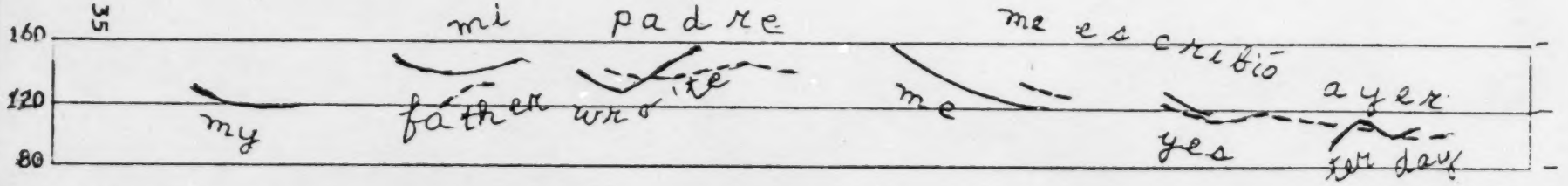
Fundamental Frequency (F_0) from Spectograms

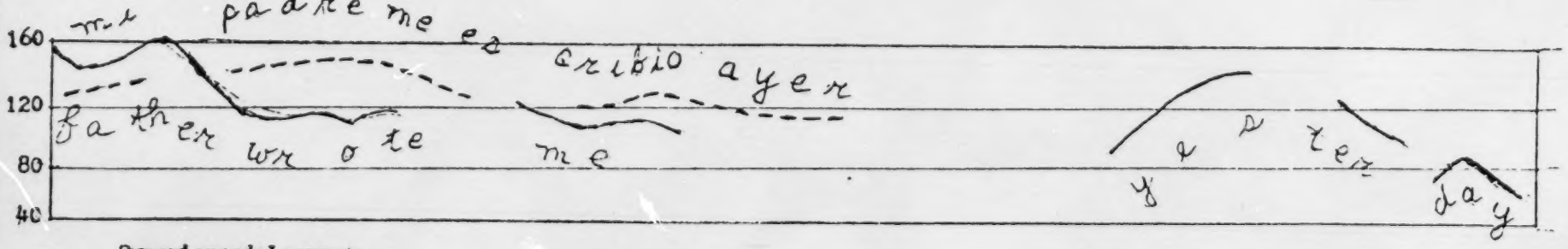
"My father wrote me yesterday" ——
"Mi padre escribió ayer" ------



American Speaker



New Arrival



Experienced Learner

TABLE I

Ten Intonation Problems of Two Spanish-speakers Learning English N. Backman

Comparison of Acoustic Results (averages measured in hz)

1. Range

American	New Arrival Spanish	New Arrival English	Experienced Speaker Spanish	Experienced Speaker English
90	35	50	45	80

Statements

	American	New Arrival Spanish	New Arrival English	Experienced Speaker Spanish	Experienced Speaker English
2. Initial Rise	70	-5	10	15	35
3. Final Fall	95	20	30	20	50
4. Rise to final stressed syllable	37	10	-1	0	14

5. Pitch prominence was placed on a syllable occurring early in the sentence. The American had a prominent syllable at the end of the sentence. In Spanish the pitch prominence was also placed on a syllable early in the sentence.

TABLE II

Ten Intonation Problems of Two Spanish-speakers Learning English N. Backman

Comparison of Acoustic Results (averages measured in Hz)

Yes/No Questions

	American	New Arrival Spanish	New Arrival English	Experienced Speaker Spanish	Experienced Speaker English
6. Final Rise	105	45	-5	45	20
7. Sentence Elevation from BOR	15	35	30	40	25

8. The peaks of important words did not form an ascending slope. In the American speech, the pitch rose increasingly for each important word in the question. in Spanish, the slope of the peaks was level or descending.

9. Within important words the pitch movement did not occur as a strong rise + fall. In the American speech there was a rise + fall curve for important words in a question; in Spanish, the syllables had only a sharp drop.

10. The Unexpected Finding - Pitch movement on the segmental /r/, /l/, /w/, /y/.

American	New Arrival English	Experienced Speaker English
35	8	13